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Amendments to the Specification:

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increases typically would require structure reinforcement or replacement, wherein such infrastructure modifications are typically not financially feasible. Thus, there is financial motivation to increase the load capacity on electrical transmission cables while using the existing transmission liens.

European Patent Application No. ~~EP116374A3~~ EP1168374A3 discloses a composite core comprised of a single type of reinforced glass fiber and thermoplastic resin. The object is to provide an electrical transmission cable which utilizes a reinforced plastic composite core as a load bearing element in the cable and to provide a method of carrying electrical current through an electrical transmission cable which utilizes an inner reinforced plastic core. The composite core fails in these objectives. A one fiber system comprising glass fiber does have the required stiffness to attract transfer load and keep the cable from sagging. Secondly, a composite core comprising glass fiber and thermoplastic resin does not meet the operating temperatures required for increased ampacity, namely, between 90 and 230 °C.

Composite cores designed using a carbon epoxy composite core also have inherent difficulties. The carbon epoxy core has very limited flexibility and is cost prohibitive. The cable product having a carbon epoxy core does not have sufficient flexibility to permit winding and transport. Moreover, the cost for carbon fibers are expensive compared to other available fibers. The cost for carbon fibers is in the range of $5 to $37 per pound compared to glass fibers in the range of $.36 to $1.20 per pound. Accordingly, a composite core constructed of only carbon fibers is not financially feasible.

Physical properties of composite cores are further limited by processing methods. Previous processing methods cannot achieve a high fiber/resin ratio by volume or weight. These processes do not allow for creation of a fiber rich core that

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temperatures. The fibers used in the present invention have the ability to withstand operating temperatures between the range of about 90 and about 230 °C. Most preferably, the fibers in the present invention have the ability to withstand operating temperatures between the range of about 170 to 200 °C. Moreover, fibers used in the present invention can preferably withstand an ambient temperature range between about –40 to about 90 °C. That is, under ambient conditions with no current flowing in an ACCC cable, the composite core is able to withstand temperatures as low as about –40 °C without suffering impairment of physical characteristics.

Relative amounts of each type of reinforced fiber varies depending on the desired physical characteristics of the composite cable. For example, fibers having a lower modulus of elasticity enable formation of a high strength, stiff composite core. Carbon fibers have a modulus of elasticity preferably in the range of about 22 to about 37 Msi whereas glassfibers are considered low modulus reinforced fibers ~~having a modulus of elasticity in the range of about 6 to about 7 Msi~~. The two types of fibers may be combined to take advantage of the inherent physical properties of each fiber to create a high strength, high stiffness composite core with added flexibility. In one embodiment, for example, the composite core comprises an inner carbon/resin core having an area of 0.037 sq. in. and a fiber resin ratio of about 70/30 by weight and an outer glass/epoxy layer having an area of 0.074 sq. in. and a fiber/resin ratio of about 75/25 by weight.

In accordance with the present invention, the physical characteristics of the composite core may be adjusted by adjusting the fiber/resin ratio of each component. Alternatively, the physical characteristics of the composite core may be adjusted by adjusting the area percentage of each component within the composite core member. For example, by reducing the total area of carbon from 0.037 sq. in. and increasing

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in the fiber/resin composite is within the range of about 50 to about 57% by value. Most preferably, the volume fraction is calculated to yield a fiber/resin ratio of 72% by weight depending on the weight of the fiber.

In accordance with the present invention, the composite core is designed based on the desired physical characteristics of an ACCC reinforced cable. More preferably, the composite core is designed having an inner strengthening core member comprising an advanced composite surrounded by an outer more flexible layer. An advanced composite is a composite having continuous fibers having a greater than 50% volume fraction and mechanical properties exceeding the mechanical properties of glassfibers. Further, it is preferable to have an outer layer low modulus composite having mechanical properties in the range of glass fiber. A low modulus fiber has mechanical characteristics in the range of glass fiber. The mechanical properties of glass fibers accommodate splicing whereas the advanced composite is more brittle and does not undertake splicing well.

Fibers forming an advanced composite are selected preferably having a tensile strength in the range of about 350 to about 750 Ksi; a modulus of elasticity preferably in the range of about 22 to about 37 Msi; a coefficient of thermal expansion in the range of about -0.7 to about 0 m/m/C; yield elongation percent in the range of about 1.5 to 3%; dielectric properties in the range of about 0.31 W/m·K to about 0.04 W/m·K; and density in the range of about 0.065 lb/in^3 to about 0.13 lb/in^3.

Fibers forming the outer low modulus layer surrounding the advanced composite preferably have a tensile strength in the range within about 180 to 220 Ksi; ~~a modulus of elasticity preferably in the range of about 6 to 7 Msi;~~ a coefficient of thermal expansion in the range of about 5×10^{-6} to about 10×10^{-6} m/m/C; yield elongation percent in the range of about 3 to about 6%; and dielectric properties in the

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weight. Accordingly, these physical characteristics are taken into account in designing the composite core.

While it is preferable to form a composite core having an inner advanced composite surrounded by a low modulus composite, it is feasible to make a composite core comprising interspersed high modulus of elasticity fibers and low modulus of elasticity fibers. Depending on the strain:failure ratio, this type of core may have to be segmented in order to achieve an appropriate degree of winding. Moreover, the composite core is designed having the fiber of increased modulus of elasticity in the inner core surrounded by a fiber having a lower modulus of elasticity due to the decreased degree of strain on the inner core.

For example, carbon is selected for high modulus of elasticity in the range of about 22 to about 37 Msi, low thermal expansion coefficient in the range of about -0.7 to about 0 m/m/C, and elongation percent in the range of about 1.5 to about 3%. Glassfibers are selected for low modulus of elasticity ~~in the range of about 6 to about 7 Msi~~, low thermal expansion coefficient in the range of about $5x10^{-6}$ to about $10x10^{-6}$ m/m/C and elongation percent in the range of about 3 to about 6%. The strain capability of the composite is tied in with the inherent physical properties of the components and the volume fraction of components. After the fiber/resin composite is selected, the strain to failure ratio of each fiber/resin composite is determined. In accordance with the present invention, the resins can be customized to achieve certain properties for processing and to achieve desired physical properties in the end product. As such, the fiber/customized resin strain to failure ratio is determined. For example, carbon/epoxy has a strain to failure ratio of 2.1% whereas glassfiber/epoxy has a strain to failure ratio of 1.7%. Accordingly, the composite core is designed having the stiffness of the carbon/epoxy in the inner core and the more flexible